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LABORATORY STUDIES OF ATOMIC COLLISION PROCESSES(U)
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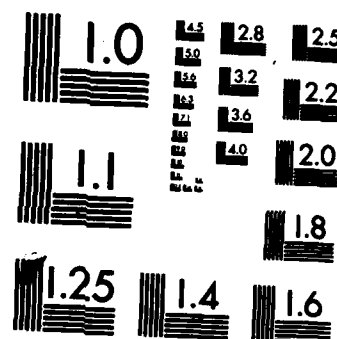
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) dissociative recombination, electrons, excited states, ion-molecule interactions & reactions, charge transfer, radiative charge transfer, lasers, fast switches, associative ionization, trimer ions, high pressure recombination, rearrangement collisions		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The various electron production and removal and ion-molecule reactions investi- gated experimentally under the ARO grant are enumerated. Reports containing the detailed scientific progress of these studies are cited. In addition, a list of the journal articles describing the results of the experimental investigations together with appropriate citations, is given.		

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I. Scope of the Research Program

Experimental investigations were carried out during the grant period, 80-09-01 to 83-10-31, concerning basic atomic collision processes involving reactive collisions of electrons, ions and neutrals. These fundamental studies have applications in modelling high power laser plasmas, high power, fast switches and ionized regions of the earth's atmosphere.

The topics investigated include:

A. Electron production and removal processes

1. Dissociative recombination of trimer ions (Ne_3^+) as a function of electron temperature.
2. Associative ionization in noble gases ($\text{Xe}^* + \text{Xe}$).
3. Recombination of complex ions (C_mH_n^+) in CH_4 -Ne mixtures.
4. Exploratory measurements of electron ion recombination at high ($\geq$ atmospheric) pressures.

B. Ion-molecule reactive collision processes

1. Charge transfer, atom transfer and rearrangement collisions of ions in methane.
2. Photon-induced charge transfer/radiative charge transfer for the He^+ -Ne system.

The results of these studies are described in the six semi-annual technical progress reports of this grant and in publications listed in the next section.

II. Publications during the present grant (reprints available on request)

"Charge transfer of atomic and molecular rare-gas ions with mercury atoms at thermal energy", Rainer Johnsen and Manfred A. Biondi, J. Chem. Phys. 73, 5045 (1980).

"Ion-molecule reactions of He^+ , Ne^+ , N^+ , N_2^+ , N_3^+ , and N_4^+ ions with Hg atoms and HgBr_2 molecules at thermal energy", Rainer Johnsen and Manfred A. Biondi, J. Chem. Phys. 73, 5048 (1980).

"Dissociative recombination of Hg_2^+ ions and electrons: Dependence of the total rate coefficient and excited state production on electron temperature", Vidya Jog and Manfred A. Biondi, J. Phys. B 14, 4719 (1981).

"Electron temperature dependence of the dissociative recombination of Ne_3^+ ions with electrons", Jeffrey A. Macdonald, Manfred A. Biondi and Rainer Johnsen, J. Phys. B 16, 4273 (1983).

"Spectroscopic observations of the radiative charge transfer and association of helium ions with neon atoms at thermal energy", Rainer Johnsen, Phys. Rev. A 28, 1460 (1983).

III. Participating Scientific Personnel

Faculty: M. A. Biondi and Rainer Johnsen

Graduate Students: J. Dulaney
S. Dheandhanoo
B. Ganguli
V. E. Jog, (Ph.D. December 1981)
J. A. Macdonald (Ph.D. August 1982)

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